



Development of and change in the software and IT-enabled services industry in Dalian, China

著者	Zhang Yan
journal or publication title	TERG Discussion Papers
number	361
page range	1-18
year	2017-03
URL	http://hdl.handle.net/10097/00121009

TERG

Discussion Paper No.361

Development of and change in the software and
IT-enabled services industry in Dalian, China

Yan Zhang

March 2017

TOHOKU ECONOMICS RESEARCH GROUP
Discussion Paper

GRADUATE SCHOOL OF ECONOMICS AND
MANAGEMENT TOHOKU UNIVERSITY
27-1 KAWAUCHI, AOBA-KU, SENDAI,
980-8576 JAPAN

Development of and change in the software and IT-enabled services industry in Dalian, China

Yan Zhang (Tohoku University)

Abstract

The software and IT-enabled services (ITES) industry in Dalian, China exhibits certain characteristics given its deep relationship with Japan. However, of late, the proportion of exports to Japan has decreased substantially. Hence, Dalian must progress from being an offshore base for Japan. This study discusses the changes in the domestic and international environments and analyzes their causes to explain the growth in the ITES industry in Dalian. In recent years, software and ITES companies in Dalian have been upgrading offshore services to Japan and expanding their business for the domestic market. Meanwhile, the positive lock-in effect to Japan has effectively advanced to upstream or high value processes in the software industry through long-term business relationships with Japanese partners. Furthermore, China's domestic business is facing a spillover effect from the use of the human resources and technology accumulated through offshore development in Japan. However, there are negative lock-in effects, too. For example, some companies cannot avoid dependence on offshore contractors because their range of business skills and knowledge is limited. Other companies are familiar with operating in the mature Japanese market, making it difficult for them to function efficiently in the highly volatile Chinese market.

Keywords: Dalian, software and IT-enabled services industry, spillover effect, lock-in effect

1. Introduction

(1) The purpose of this research

This study examines the development of and change in the software and IT-enabled services (ITES) industry¹ in Dalian, China. In particular, we address the structural transformation of the industry from offshore development and services for clients in Japan as well as the subsequent growth of Japanese and local companies.

The development of the software and ITES industry in Dalian has special significance for

China. According to research by the World Bank, the Chinese software and ITES industry is distinctive in that it has a high ratio of software products for domestic supply in comparison to India, which provides software services globally (Gregory et al., 2009). Meanwhile, the industry in Dalian developed as an offshore outsourcing base for Japan, as indicated by the various studies examined below. The growth in exports based on the principle of comparative advantage became a driving force in this case. However, the existing comparative advantage is undergoing a shake-up following changes in both supply and demand, with fluctuations in the Japanese market and increasing cost pressures within China. The software and ITES industry in Dalian is now facing some empirical questions: Is the era of growth driven by offshore development for Japan coming to an end? Can the vitality of the industrial organization be maintained? Will new businesses be created? Will the significance of the relationship with Japan alter?

(2) Theoretical background

Based on the principle of comparative advantage, focusing on exports in areas with an advantage and supplying to domestic markets to benefit from the advantages of proximity are both rational directions for industrial growth. China's transition from factory to market alongside its economic development, as seen in the manufacturing industry, is also occurring in the ITES industry. For a more specific examination of this transition, one must consider that the ITES industry in Dalian is part of a global value chain (GVC). The software and ITES industry in Dalian is approaching a stage of development (which can be reached through several paths), beyond concentrating on labor-intensive processes in the global division of labor. Despite development possibilities based on economic resources accumulated through previous activities within the GVC, growth beyond a certain point is constrained by the existing structures of the GVC (Humphrey and Schmitz, 2002).

While economic pressures in development do exist, it is those companies that are subject to these pressures that bring about specific development. They face concrete questions on how to use their accumulated economic resources and what directions could be pursued. Considering these possibilities and limitations, we must clarify what strategic choices are made and how administrative resources are used by companies that constitute the regional industry to grow further. The changes in the software and ITES industry in Dalian can thus be considered to be a case study on how growth options can be chosen by management from among several possibilities.

(3) Previous research

Many studies of the software and ITES industry in Dalian, and in China as a whole, highlight the close relationship with Japan and primarily discuss Japan-oriented offshore development and services. Moreover, an ever-increasing number of studies discuss the changes in this industry in Dalian and new development paths. The main arguments are outlined below.

The first point pertains to the theoretical framework through which one can understand the economic pressures pushing for change in Dalian. Tajima (2008) considered the international

division of labor in the software industry between Japan, the developed regions of China, and midwest China to be an example of the flying geese pattern of development. The relocation to Vietnam, which became notable in the 2010s, may also be interpreted through this lens (Nishizaki, 2014). However, in these studies, whether the change aims at overseas business or business diversification intended for the domestic market was not discussed.

The second point pertains to an empirical understanding of the changes in the industrial organization of the software and ITES industry in Dalian. Since 2005, an annual report on this industry has been published.² In addition to combining data on aspects including business lines, exports, companies, and human resources, the report focuses on the government's industrial policies and business rankings. However, this report describes changes based largely on statistics and does not delve into the theory of industrial development. Further, while the features and formation processes of Japan-oriented offshore development and services in Dalian were discussed by Zhang and Kawabata (2012), they studied the formation processes of the industry and did not examine subsequent changes. There have been several situational analysis studies of the growth, characteristics, and issues of Dalian as a base for Japan-oriented offshore development (Fuchida, 2013; Tajima, 2008; Li, 2010; Inoue, 2009; Katoku, 2005; Kobayashi, 2016). While arguing the importance of exports to Japan, Fuchida (2013) asserted that business diffusion toward the regional cities of China and southeast Asia is important for Japan. The studies by Inoue (2009) and Murakami and Liu (2008) are based on surveys of the conditions in Dalian. However, these studies aim to clarify the general issue of developed countries' influence on offshore regions. Takahashi (2013) added to this perspective of the influence on Japan. Li (2010) analyzed industry integration through comparative methods, using the cases of the Dalian Economic and Technical Development Zone, Dalian Hi-Tech Zone (DHZ), and Dalian Software Park (DLSP). These studies analyze the industrial organization of Dalian and survey the anticipated directions of change; they do not, however, adequately address what types of change have actually occurred. Some studies point to the important role of business bases in Japan as indicators of offshore business growth toward the country (Zhang and Kawabata, 2013; Takahashi, 2009; Zhang, 2016); however, no comprehensive investigation has appeared thus far.

The third point is how we should evaluate the influence exerted on the software and ITES industry in Dalian as a base for Japan-oriented offshore development. There are two differing opinions about this. Most of the existing studies noted in the previous paragraph are optimistic. They indicate that Japan-oriented business expansion and demand have raised capital, advanced technology, and grown markets in relation to the software and ITES industry in Dalian. Further, the existence of Dalian as an offshore base has contributed to Japan's information services industry (Kawabata, 2014). Zhao and Watanabe (2008) found that the growth of Japan and China is co-evolutionary because of the existence of Japanese markets, but also pointed out that the stagnation of Japan's innovation systems is a hindrance. On the contrary, Parthasarathy and Palavalli (2011) noted that participation in Japanese markets is a double-edged sword. Although the technology transfers by Japanese companies to the information services industry in Dalian was made possible

by entry into Japanese markets, entering Japanese markets with their closed systems creates a lock-in effect that limits growth possibilities, unlike in Bangalore with its open markets that allow global access. However, more evidence-based analyses need to be conducted on the advantages and disadvantages of this lock-in effect and how they interact. Furthermore, from a business research perspective, we should consider whether the capabilities accumulated by companies through previous work are being used in new growth pathways. This may be understood as a spillover effect. When a spillover occurs, we should be aware of the positive and negative aspects of the lock-in effect, which leads to continued relations with previous business partners.

(4) Analytic perspectives and research methods

Based on the above empirical and theoretical background, this study examines the growth possibilities and limitations for the software and ITES industry in Dalian from the changes in domestic and overseas conditions; it also examines how this industry and individual companies are looking for new growth paths in line with these changes. Section 2 clarifies these circumstantial changes and Section 3 examines whether business development and healthy competition are observed in the industrial organization. Section 4 examines how software and ITES companies are promoting business diversification for domestic markets and business growth beyond offshore development (Humphrey and Schmitz, 2002).³ Here, particular attention is paid to the use of the business resources accumulated within companies and the workings of the spillover and positive/negative lock-in effects on these.

The primary research method used is qualitative analysis based on interviews, supplemented by a literature review. In addition, statistical analysis is conducted mainly using DLISSO (annual) for the overall trends in the industry. The records of the interviews undertaken with software and ITES companies, industry groups, and government bodies between 2010 and 2016 were used for individual details. Interviews were conducted six times in Dalian, once in Shenyang (also in China), and four times in Japan.

2. Environmental changes in the software and ITES industry in Dalian

(1) Dalian as a base for Japan-oriented offshore development

The software and ITES industry in Dalian has traditionally focused on being an offshore service base for Japan (Zhang and Kawabata, 2012). In 2014, the Dalian industry, with an export rate of 19.3%, easily overtook the rate of 9% for China as a whole and ranked second in exports across the country (DLISSO, 2014). Furthermore, when a business in Dalian is contracted for offshore services, a part of which is later subcontracted, the subcontracted work is classified in the statistical data as being for the domestic market. Therefore, the proportion of work undertaken for export is effectively higher than the reported estimates. The proportion of exports to Japan surpassed 90% at its peak (DLISSO, annual).

The software and ITES industry in Dalian has formed clusters, with the DHZ accounting

for 81% of 2012 sales, 61.2% of which was concentrated in the DLSP (DLISSO, 2013). While local companies⁴ such as Neusoft, DHC, and HiSoft (now Pactera) played a central role in the establishment of the DLSP, overseas companies were also extremely important. In 2013, 90 companies on the Fortune Global 500 list invested in the DLSP. Both Japanese and Western companies in the DHZ and DLSP have focused on business for the Japanese market (DLISSO, 2014).

The Japan connection was also exploited for human resource development. Dalian was a base for Japanese language education in China; many students specialized in Japanese and the proportion of the population that had taken the highest level (N1) of the Japanese language proficiency test was the highest among major cities in China. Starting with the three major local companies, many software and ITES business founders and managers had experience of studying in Japan and/or working for Japanese companies. Dalian has also helped returnees establish companies, such as by setting up the Dalian Hi-Tech Business Incubator (Zhang and Kawabata, 2012).

(2) Domestic and overseas economic changes triggered by the global financial crisis

Japan-oriented offshore development was greatly affected by the global financial crisis triggered by the collapse of Lehman Brothers in 2008; the Great East Japan Earthquake in 2011; and the long-lasting depreciation of the yen since 2013. Growth in the Japanese information services market slowed after the onset of the crisis and became negative in 2009. This lasted for three consecutive years until 2011 as a result of the subsequent Great East Japan Earthquake (JISA, annual). Meanwhile, the total value of offshore orders registered negative growth in 2009 (Association for the Promotion of Information Processing IT Personnel Training HQ, 2011). However, this trend reversed in the following year, with almost no decrease in offshore development orders for China. Cost-cutting motivation actually supported the move from onshore to offshore locations. However, strong cost-cutting pressure led to performance deterioration in small and medium-sized enterprises. Moreover, since the unit costs of offshore development were calculated in yen, the depreciation of the yen from 2013 caused sales converted into Chinese yuan to drop by as much as 30–40%.⁵

In addition to cost pressures such as the sharp increase in commodity prices across China and the rise in personnel costs, new low-cost offshore development bases have emerged in areas such as the inland regions of China and Vietnam, increasing competition with companies in Dalian. Although the rental prices of office space in the DHZ have not increased appreciably, the infrastructure costs for setting up Internet environments, for example, are increasing rapidly. Labor costs in Dalian's IT industry have also reached high levels, ranking just under those in the finance and real estate industries and thus becoming a great burden on management (Fuchida, 2013). Meanwhile, the severe labor shortage continued to be a significant issue. During the formation period of the industry in Dalian, the focus areas in software development processes were coding and unit testing; accordingly, even personnel without Japanese language ability or expert knowledge could work in the industry. Later, however, with the increase in specialist work such as business

process outsourcing (BPO), language skills and expert knowledge became necessary. Furthermore, emerging fields such as mobile communications and Internet industries need large numbers of relevant personnel. However, universities cannot adjust their subjects and teaching materials to train students immediately. Shortages of IT personnel (skilled engineers, multifaceted workers, and skilled programmers) therefore continue to plague the industry.⁶

New offshore development bases are on the rise, competing with Dalian. Many companies in Japan have begun to take notice of Vietnam (Association for the Promotion of Information Processing IT Personnel Training HQ, 2011). Inland cities such as Chengdu, which have an advantage in terms of human resources and costs, are focusing on the software industry. In fact, some Dalian companies are considering relocating simple data-entry tasks to inland or northern areas.

Meanwhile, In particular, Chinese mobile communications and Internet industries have been developing rapidly in recent years. The Chinese e-commerce retail market, with a total value of 630 billion dollars (about 75.6 trillion yen) in 2015, surpassed the equivalent US market.⁷ Although this trend may create opportunities in Dalian's industry, it also leads to competition for talent because personnel are lured away from software development and BPO to other emerging fields. For instance, the wage costs of Japan-oriented offshore development companies have been influenced by the high salaries offered by Huawei, which came to Dalian in 2015.⁸

On the whole, the software and ITES industry in Dalian is losing the advantage of low wages and availability of labor for offshore software development; the industry is thus approaching a turning point in its business.

3. Maintenance of a competitive industrial organization and growth of local companies

(1) Industry growth

The software and ITES industry in Dalian began to develop in earnest after the city government made clear its stance of invigorating the software industry in 1998, and the DLSP was set up with this support (Zhang and Kawabata, 2012). Since then, this industry has developed rapidly in the space of under 20 years. Sales figures stood at 200 million yuan in 1998, but reached 147 billion yuan in 2014. Of the 2,063 companies in 2014, 252 were foreign owned. Around 247,000 people are now working in this industry. Moreover, Dalian accounts for around 4% of the sales in the domestic software and ITES industry in China, ranking ninth among all cities (DLISSO, 2014).

The industry in Dalian grew at an average rate of over 20% annually until 2013; however, the growth rate dropped to single figures in 2014. While sales in the software and ITES industry in China increased in 2014 by 20.2% over the previous year to 3.7 trillion yuan, sales figures for the industry in Dalian stood at 147 billion yuan, an increase of 8.9% over the previous year.

(2) Market diversification

Over the past few years, the software and ITES industry in Dalian has been diversifying beyond its role as an offshore base for Japan. First, the industry's export ratio gradually dropped from 27.8% of sales in 2005 to 19.2% in 2014. Although Japan has remained the focus for exports, its share is decreasing rapidly. The export ratio for Japan decreased by around 40 percentage points, from 90.9% in 2009 to 52.8% in 2014. Meanwhile, the ratio for Europe and the United States increased sharply from 5.6% in 2009 to 30.2% in 2014. The ratio for other countries and regions (e.g., other Asian countries, Latin America) increased from 3.5% in 2009 to 17.1% in 2014 (DLISSO, 2010, 2015). While the dampening of export growth in China as a whole may be explained by the plateauing of the global economy, the decrease in the ratio of Dalian's exports to Japan is notable, as are the increases for Europe, the United States, and other countries and regions. IBM, Citigroup, and India's Tata Consultancy Services (TCS), for example, have recently been expanding their operations in Dalian for the European and US markets. In particular, India's TCS established a global delivery center in 2012 (DLISSO, 2014), and the US pharmaceutical company Eli Lilly set up a global IT innovation center in 2013, both in Dalian.⁹

(3) Rise of local companies

In recent years, local companies in the industry in Dalian have enjoyed notable growth. First, the number of employees in local companies grew from 55,200 in 2011 to 180,700 in 2014; by contrast, the number of employees in foreign companies dropped from 66,900 in 2011 to 62,800 in 2014 (DLISSO, annual). The substantial decrease in the number of foreign company employees is the direct result of the decrease in the number of foreign companies.

Second, local company sales increased from 33.5 billion yuan in 2011 to 98.1 billion yuan in 2014. In 2011, sales by foreign companies, which amounted to 34.2 billion yuan, were slightly more than local company sales but less than half of local company sales in 2014 at 46.2 billion yuan (DLISSO, annual). Hence, sales by local companies have grown by a far greater extent than those of foreign companies.

Meanwhile, the profit ratios for foreign and local companies were 1.3% and 5.3%, respectively in 2014 (DLISSO, annual). While the profit ratio for foreign companies has dropped substantially in recent years, this has not been the case for local companies.

Regarding sales rankings, of the top 10 companies, five in 2009 and three in 2014 were foreign. The number of local companies increased from five in 2009 to seven in 2014. Of the top 20 companies in 2014, 16 were local and four were foreign. Regarding the ranking in total sales, exports, and sales in each business sector, foreign companies may be somewhat stronger than local companies in exports and in the IT consulting sector. However, in all other sectors, local companies are stronger (Table 1).

Table 1: Dalian software and ITES industry rankings: comparing the number of top local and foreign companies

Ranking name	Local	Foreign
Software business sales	9	6
Software business exports	7	8
System integration business	14	1
Software development sales	11	4
IT consulting business	7	8
Data processing business	10	5
Combined Dalian software business	11	4
IC design business	10	0

Note: “IC design business” features the top 10 companies; all other sectors feature the top 15 companies.

Source: Author, compiled from DLISSO (2014).

By the end of 2014, 11 Dalian companies had successfully entered the new over-the-counter market.¹¹ Since 2012, 12 Dalian companies—of which 10 are software companies—have entered the Deloitte DDT High Tech China Top 50 ranking (DLISSO, 2014). Further, the slowdown in Japan-oriented offshore development may be linked to the withdrawal of foreign companies. Meanwhile, the growth of local companies has compensated for this.

(4) Competitive industrial organization

The number of companies decreased sharply in 2008 owing to the impact of the financial crisis, but increased afterwards, reaching 2,063 in 2014. The average number of company employees peaked in 2009, but this has been slowly decreasing since. Judging from the number of company personnel, we may say that this industry has shown a tendency toward more a diverse company size since 2008. Although the proportion of small companies (i.e., those with fewer than 100 people) has fallen, the proportion of companies with 100–299 people has increased (Figure 1).

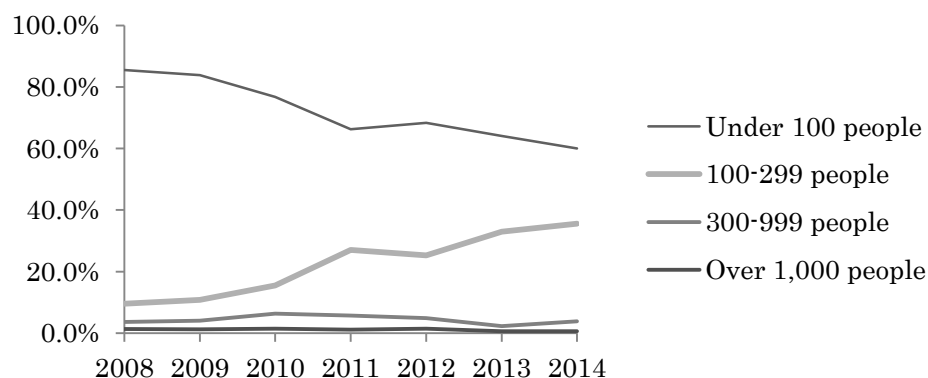


Figure 1: Trends in the proportion of workforce size in Dalian software and ITES companies

Source: Author, compiled from each year’s DLISSO (annual).

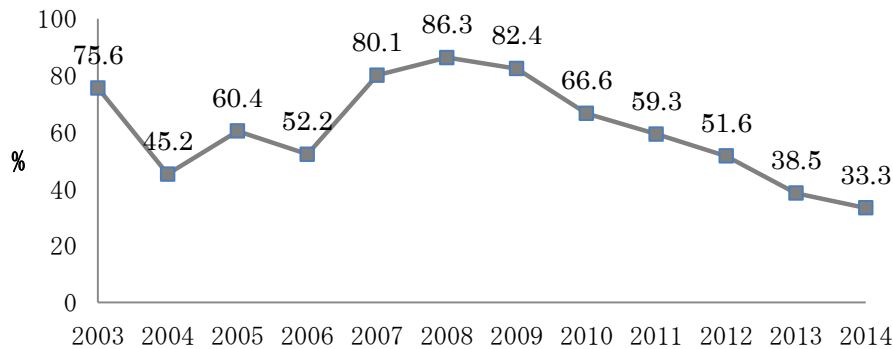


Figure 2: Share of the top 30 companies in total software industry sales

Source: Author, compiled from the various editions of DLISSO (annual).

Furthermore, the sales of the top 30 companies as a proportion of total software industry sales peaked in 2008 and has been falling since then (Figure 2).

The growth rate of the software and ITES industry is lower in Dalian than in China as a whole. However, the industry has witnessed continuous growth, and the number of companies has been increasing. Local companies are growing, supplanting foreign companies; the share of the top 30 companies' sales is decreasing, and small and medium-sized enterprises are growing in prominence. Considering these circumstances, we may say that the industry is healthy and competitive.

(5) Changes in the business sector

Owing to the extremely intense technological changes in the software and ITES industry on the one hand and intense changes in statistical standards on the other, business changes cannot be discerned in detail, even from DLISSO (annual). Figure 3 shows only a rough categorization.

The proportion of software technology services has been overwhelmingly higher than other categories. This is considered to be due to the large intake of labor-intensive work such as coding through offshore development. Furthermore, there has been a rapid rise in software products since 2009, growing to around the same level as software technology services in 2013, in terms of the proportion of business. We may consider this to be a manifestation of the industry's ability to handle original brand software development. Meanwhile, software technology services also show continued growth. Because of the considerable revision to the statistical classification, this fact cannot be conclusively proven; however, according to the several examples that follow, this industry segment in Dalian may be undergoing a change toward more advanced business solutions. We may surmise that this segment is developing beyond simple coding work and service offerings are becoming increasingly important.

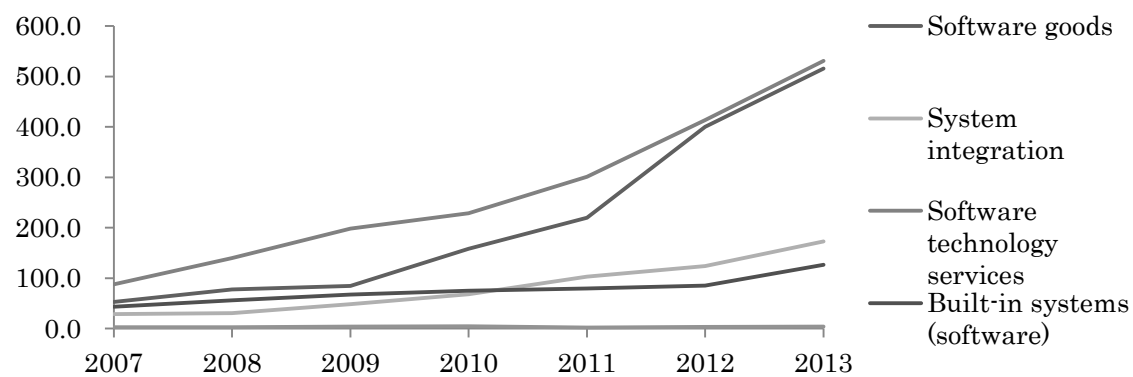


Figure 3: Trends in software and ITES industry sales per business segment¹⁵

Note: “Software technology services” = Data processing and management services + IT consulting services.

Source: Author, compiled from DLISSO (annual).

4. Progress beyond Japan-oriented offshore development

(1) Transaction structures of Japan-oriented offshore development

The growth of the software and ITES industry in Dalian was driven by Japan-oriented offshore development, which was characterized by specific transaction structures.

Japan’s software industry is the world’s third largest in market size. Offshore development in this industry amounted to 1.4 billion dollars in 2014, and 75% of orders were to China.¹² According to surveys, the driving forces for Japanese IT vendors to undertake offshore software development are cost reduction and the availability of technical experts lacking in Japan (Association for the Promotion of Information Processing IT Personnel Training HQ, annual). The core offshore services of Dalian companies ordered by Japan thus initially focused on offshore software development, and later included large amounts of labor-intensive ITES businesses.

Offshore development in Dalian has been influenced by the following structural characteristics of Japan’s software industry. First, it is not strongly competitive in packaged software for market sale. In Japan, demand for individual software that reflects the needs of individual customers is strong (Umezawa, 2007). Second, this bespoke software is often developed through a waterfall model process.¹³ Third, it has a multi-layered subcontracting structure, where the original vendors (also called “primary vendors”) contract out part of the development work to smaller secondary subcontractors, who in turn subcontract some of their work to tertiary subcontractors (Satō, 2008). Fourth, the Japanese language is used in development documentation and communication.

Under the structures above, the offshoring process started from the most labor-intensive process on the bottom layer and proceeded toward the upper layer. In other words, it initially involved coding and unit testing (termed the “first stage”) and then detailed design and integration testing (termed the “second stage”). This is how the international division of labor in software

development evolved between Japan and China. In the formative stages, Dalian-based software companies would act as vendors in the second tier or below in the subcontracting system. There were some “floating” deals in subcontracting, but companies would gradually accumulate long-standing continuous deals. Being a one-off production system, many changes in specifications would occur in the waterfall model development of bespoke software, necessitating frequent communication between the original contractor and subcontractors. This often led to various issues (Kochi, 2008). Thus, purchasers would come to select superior subcontractors for continued orders.

(2) Growth and specialization of Japan-oriented offshore development

Japan-oriented offshore development is nearing a turning point because of the slowdown in the growth of Japanese markets and emergence of low-cost offshore bases such as China’s inland regions and Vietnam.

On the one hand, Dalian-based software companies, on the basis of long-term, continuous partnerships with Japanese vendors, will continue to receive orders for more advanced work in Japan-oriented offshore development or for specialist ITO work related to offshore development. With regard to the former, we may observe local companies branching out into requirement definition and integration testing. Several local major companies have installed business and development bases in Japan. They not only dispatch engineers from Dalian to Japan to handle requirement definition and basic design, but also hire and train in Japan. They established business processes in which requirement definition and basic design are conducted at their bases in Japan, rather than in the main offices in Dalian.¹⁴ The business diversification of large-scale local companies I and Z are examples of the latter. New businesses of Company I include migration and testing, software conversion for the change to an open system, and checking software compatibility for version upgrades to IT equipment. Company Z is diversifying into IT system management, including technical support, helpdesk services, system operation, and monitoring.¹⁵ Examples of smaller companies are also available. To avoid large differences in press and slack in business following new developments, a local small company (Company E), aiming at continued work orders, made efforts toward business expertise acquisition and sales promotion for Japanese insurance companies, and succeeded in securing direct contracts in maintenance work with major insurance companies.¹⁶ In such cases, local companies were able to make profits easily by dealing directly with Japanese user companies; additionally, it became easier to acquire sector expertise.

However, some companies could not venture into new businesses because of the deep dependence on Japan-oriented offshore software development and limited range of technical skills and business expertise. For instance, a move to higher-level work and production processes with higher added value would clearly be desirable for Company A, a local BPO company created in the 1990s. Nonetheless, with no incentives to change its behavior that brought success in the past as a tried and tested formula, the company continues to focus on data entry alone.¹⁷ Similarly, Company D, another small local business long engaged in Japan-oriented offshore development, had no choice but to close down all bases but its headquarters in Dalian to cut costs due to the depreciation

of the yen in 2013.¹⁸

Japan-oriented offshore business faces a fundamental problem in that it is restricted to the Japanese market. Japan's software and ITES industry is not globally competitive, with a constant software trade deficit. Accordingly, there are constraints for companies that still pursue Japan-oriented offshore business expansion, meaning that industry export ratios and the share of exports to Japan have dropped. The expansion of business oriented to the Chinese market is therefore an effective alternative.

(3) Expansion of business oriented to the Chinese market

The software and ITES industry market in China grew from 757.3 billion yuan in 2008 to 3.1 trillion yuan in 2013, exhibiting a far greater growth rate than that of the Japan-oriented offshore software market. The move toward this market was a natural progression. The financial crisis and subsequent long-lasting depreciation of the yen became a driving force behind this transition. Let us analyze China-based Japanese companies and local companies separately.

Company Q Software Dalian is a software development base for the major Japanese electric and electronic home appliance manufacturer, Company Q. It expanded business for the factories of Company Q in China in response to the expansion of home appliance markets. However, because of the poor performance of the headquarters in Japan and rapid depreciation of the yen, the company faced no choice but to accelerate its market change toward business for Chinese clients.

One obstacle here was that Company Q Software Dalian, as an offshore development base, had employed only technical experts. Accordingly, the company had to seek the support of Company Q's sales bases in China to develop sales programs involving various technical proposals to customers. Company Q Software Dalian even pitched to Chinese a home appliance company, a rival of parent company.¹⁹

Since second-tier Japan-oriented offshore development became unprofitable under the global financial crisis, Company B, a smaller Japanese company, used its technology and personnel acquired in the course of its Japan-oriented offshore development to switch to packaged software development and domestic sales. The CEO of Company B was a former manager of a manufacturing company. He took control of the development and sales business and sold production management software to Japanese manufacturers in the Dalian Economic and Technological Development Zone. Later, the company was liquidated because of insufficient funds, but the CEO reorganized the company and continued its activities.²⁰

Meanwhile, three major local companies in Dalian—Neusoft, DHC, and Pactera—are each focusing on Chinese domestic markets. For Neusoft, domestic business does not yet have high profit ratios, but it does account for 60% of the company's resources. Its main domestic businesses are health, government markets, and health insurance.²¹ In recent years, it has set up around 60 health-

related companies in China and has launched the healthcare management platform XIKANG throughout China.²² DHC has broken into the Chinese domestic market from three angles: industrial software development, the Internet of Things (IoT), and company support platforms.²³ For industrial software development, DHC acquired local software companies in Dalian to obtain the relevant technology and personnel. For the IoT, it set up a new company in Dalian focusing on work such as linking and controlling all household electronic goods within a house under one system. For company support platforms, DHC supports software development for smaller companies.²⁴ Pactera previously specialized in pure outsourcing; however, in recent years, it has focused on smart cities within China, which is being put into practice in Beijing.²⁵

Additionally, smaller local companies in Dalian are venturing into Chinese domestic markets and acquiring the relevant personnel and technology. For instance, Japan-oriented offshore development constituted 100% of Company L's business until 2012; however, in the past three years, business with Japan has not made much progress and the company has begun to venture into projects aimed at Chinese domestic markets. While Japan-oriented offshore development still accounts for 80% of its business, it sells its business management software, used internally within the company, to other Japanese companies located in the building in which Company L is located, and is extending its activities to the Chinese domestic sales market. The company is also participating in the Internet industry, providing its own in-house platform to the Taobao C2C web shopping mall in China and offering a service for consumers to make shopping recommendations.²⁶ Company Z established a call center and has started offering services for the domestic mobile industry, beginning with customer satisfaction surveys for Xiaomi. The company is also contracted for mobile device and PC software development for Tencent, at a scale of around 500 people.²⁷

For companies engaged in Japan-oriented offshore development—be they local or foreign companies—venturing into the Chinese domestic market is no easy task. There are issues regarding the capacities of the company, such as expanding the range of technology and strengthening sales capacity, and issues with the market environment, such as payment recovery and other “normalization” issues in the software and ITES market.²⁸

In general, the service quality of Japan-oriented offshore companies is high because they have been trained under the strict monitoring of Japanese customers. However, they lack technical expertise concerning the development process as a whole, since they have come to shoulder only part of a waterfall model development process. Furthermore, companies positioned below secondary vendors in the multi-tier subcontracting system have poor resources for engaging with customers directly.

The Chinese market is harsh on such capacity deficiencies. A delay in market standardization is a problem.²⁹ Companies accustomed to doing business with mature Japanese markets would be unfamiliar with certain aspects of domestic customers' business processes and systems with highly arbitrary behavior. For instance, one-sided specification changes could be made

without providing extra funds for development. Obtaining payment can also be difficult for newcomers regardless of whether they are foreign or local companies. This problem can be a great risk, particularly for a smaller company, where a single unsuccessful payment retrieval could lead to a crisis of bankruptcy.

As a countermeasure, many Japanese companies first sell only to Japanese companies established in China and then gradually broaden their customer base to include Chinese companies. Except for extremely large deals with Japanese businesses, local companies will retrieve payment for most of the items developed in under six months; with domestic business, however, numerous companies use the “4, 5, 1” approach. They reduce risk by retrieving 40% of payment in the contract stage, 50% upon the completion of development, and the remaining 10% a year later.³⁰

5. Conclusion

(1) Conclusions of this study

The software and ITES industry in Dalian started as a base for Japan-oriented offshore development. In recent years, it has been strongly affected by changes in both domestic and overseas circumstances, including the slowdown of growth in Japanese markets, emergence of low-cost offshore bases such as Vietnam and the inland regions of China, and expansion of Chinese domestic markets. In such conditions, the industry has begun to shift away from being a base for labor-intensive, Japan-oriented offshore development based on the principle of comparative advantage. While it has met with a sharp decline in the ratio of growth and exports to Japan, the industry as a whole maintains an actively competitive industrial organization by virtue of the growth of large-scale local companies and increase in small- and medium-sized enterprises.

The software and ITES enterprises are opening new development pathways in response to changes in economic circumstances such as increasing cost pressures and growth in domestic markets. They are trying to upgrade Japan-oriented offshore development and diversify into businesses for the domestic market by venturing into new development pathways using their accumulated business resources. From these developments, we can discern a spillover effect, where the technology and personnel acquired in Japanese offshore development are put to use. We also find a positive lock-in effect, where long-standing trade relationships with Japanese vendors encourage progress toward high value-added procedures in Japan-oriented software development processes. Meanwhile, we also observe negative lock-in effects. For example, companies are unable to break free from their dependence on Japan-oriented offshore development because they are unable to expand to other businesses with their limited range of skills and sector knowledge. Further, companies accustomed to doing business with mature Japanese markets are unfamiliar with Chinese customers, who can be capricious. However, efforts are being made to overcome these problems.

Overall, the software and ITES industry in Dalian has begun to move away from being a base for labor-intensive Japan-oriented offshore development. While more time will be needed to

discern the respective consequences, this study concludes, from the competitive nature of the industrial organization and the way in which both Japanese and local companies are engaging in development, that new developments are likely to occur.

(2) Remaining issues

This study considered industrial organization and company behavior in the software and ITES industry in Dalian. However, during the industry's formative stages and thereafter, local government policies for encouraging it have played an important role. An assessment of these policies is thus a task that remains to be undertaken in future research.

Notes

(1) The terms “information services” industry and “information technology (IT) services” industry are used in Japanese and Chinese, but these names do not necessarily capture the content of the services. Rather, it is more appropriate to recognize them as services that can be implemented because of IT (IT-enabled services); this is reflected in the English term “IT-enabled services (ITES)” industry, which we use in this paper.

(2) The editors have repeatedly revised the title from the Dalian Information Industry Bureau to the Dalian Software Industry Association, to the Dalian Economic and Information Technology Committee, and so forth. However, the edited versions of the 2012 report by the Dalian Software and Service Outsourcing Development Research Institute (DLISSO) read as the Dalian Software and IT Services Development Report. Each body is under the supervision of the city government, and the figures can be treated as government statistics. The Dalian office of JETRO has translated these reports into Japanese and distributed them under the title Dalian Software and Information Service Industry White Paper. The Japanese title of these reports in common use translates as the “Dalian IT White Papers.” To avoid confusion, we use the combined reference DLISSO [annual] for citations.

(3) Humphrey and Schmitz (2002) considered upgrading within GVCs has having four patterns: process, goods, function, and sector crossing. This study, based on the circumstances of the industry in Dalian, considers two patterns: foreign business growth from offshore development and diversification toward domestic markets. We may consider the former to encompass relatively more of the process, goods, and function factors and the latter to cover more of the sector crossing upgrade factors.

(4) In this paper, “local companies” refer to Chinese companies.

(5) Based on interviews at DLISSO in August 2014.

(6) Based on interviews at DLISSO in August 2016.

(7) Based on an April 15, 2016 McKinsey & Company Japan report; cited from Nikkei Business Publications Inc., April 25, 2016.

(8) Based on interviews at the Dalian Software Industry Association in August 2016.

(9) According to Tencent Holdings Ltd (<http://finance.qq.com/a/20130321/000067.htm>, accessed November 28, 2016).

(10) Refer to Dalian Information Industry Bureau & Dalian Software Industry Association (2009) and DLISSO (2014).

(11) The new over-the-counter market is the official title of China's “national small- and medium-sized company share transfer system,” an over-the-counter securities trade market established in September 2012

and registered under the Securities Law with the approval of the State Council. This market mainly provides services related to investment, purchase, and public transfer for unlisted companies. This nationwide over-the-counter market targets only institutional and professional individual investors (subject to conditions such as having financial capital of over five million yuan) and, therefore, has low standards for public disclosure, and usually no standards in place regarding figures in financial statements (e.g., assets, income, profit).

(12) Based on the Yano Research Institute homepage

(<https://www.yano.co.jp/press/pdf/1504.pdf#search='%E3%82%AA%E3%83%95%E3%82%B7%E3%83%A7%E3%82%A2%E9%96%8B%E7%99%BA%E8%A6%8F%E6%A8%A1>, accessed November 28, 2016).

(13) According to Furuya et al. (2008), the core processes of software development are defined as requirement definition, basic design, detailed design, programming, unit testing, integration testing, and system testing. The names and abbreviations differ slightly by company and project.

(14) This paragraph was collated based mainly on interviews at several Dalian companies with branches in Japan.

(15) Based on interviews at Company Z in August 2010 and at Company I in August 2016.

(16) Based on interviews at Company E in August 2010 and August 2013.

(17) Based on interviews at Company A in August 2016.

(17) Based on interviews at Company D in August 2016.

(19) Based on interviews at Company Q Dalian in August 2013 and August 2014.

(20) Based on interviews at Company B in August 2010 and August 2011.

(21) Based on interviews at DLISSO in August 2016.

(22) Based on XIKANG (<http://www.xikang.com/>, accessed November 28, 2016).

(23) Based on interviews at DLISSO in August 2016.

(24) Based on interviews at DLISSO in August 2016.

(25) Based on the Pactera homepage (<http://www.pactera.com/ja/about>, accessed November 28, 2016).

(26) Based on interviews at Company L in August 2016.

(27) Based on interviews at Company Z in August 2016.

(28) Based on interviews at several companies in August 2016.

(29) A direct translation of the Chinese term “guifanhua” would be “standardization,” but the meaning here is a little broader. The software and ITES industry in China is an emerging industry; its related legislation, policies, trade rules, and so forth are not clear, and it also displays a tendency toward frequent fraudulent deals and unstable management in its companies.

(30) This paragraph is a summary of interviews at several companies in an August 2016 survey in Dalian.

References

Association for the Promotion of Information Processing IT Personnel Training HQ(JISA), ed. (annual) “*IT personnel white paper*”.

Dalian Economic and Information Technology Committee (Dalian Information Services Bureau, since 2008) and Dalian Software Industry Association (Translated by the JETRO Dalian Office) (annual) “*Dalian sofutowea jōhō sabisu-gyō hakusho [Dalian software and information service industry white paper]*” .

Dalian Software and Service Outsourcing Development Research Institute (DLISSO) eds. (annual) “*Annual Report of Dalian's software and information Technology Service Industry*” Dongbei University of Finance

- and Economics Press.
- Fuchida, Yūsuke (2013) “Dalian-shi ni okeru sofutowea, jōhō sābisu sangyō no genjō [Present state of the software and information services industry in Dalian]” *JETRO Chinese Economy* 3, pp. 14-25.
- Furuya, Shinsuke (2008) “Chūgoku ni okeru nihon-muke sofutowea kaihatsu ni okeru kanri-taisei no ruikai: jōhō no dentatsu no shikumi [Types of management systems for Japan-oriented software development in Dalian: Frameworks for communicating information]” (Tashima, Toshio & Furuya, Shinsuke (eds.) “Chūgoku no sofutowea sangyō to autosōshingu kaihatsu, jinzai-haken, shokugyō-kyōiku [The software industry in China and outsourcing development, personnel dispatches, and professional training]” University of Tokyo Institute of Social Sciences Contemporary China Research Base).
- Gregory, Neil, Stanley D. Nollen, and Stoyan Tenev (2009) *New Industries from New Places: The Emergence of the Hardware and Software Industries in China and India*, World Bank.
- Humphrey, John and Hubert Schmitz (2002) *How does insertion in global value chains affect upgrading in industrial clusters?* *Regional Studies*, 39.9, pp. 1017-1027.
- Inoue, Hiroshi (2009) “Dalian ni okeru ofushoaringu no genjō to tokuchō [The present circumstances and features of offshoring in Dalian]” *Hannan University Social Sciences Journal*, 44.2, pp. 133-142.
- Japan Information Technology Services Industry Association (annual), *Jyoho Sabisu Sangyo Hakusho [White Paper on Information Service Industry]*, Tokyo: Computer Age, Inc.
- Katoku, Rin (2005) “Dalian wa moete-iru: Dalian no sofutowea kaihatsu jijō [Dalian is on fire: the state of software development in Dalian]” Software Consultant Corporation.
- Kawabata, Nozomu (trans. Zhang, Yan) (2014) “Dalian ruanjian he xinxi-jishu fuwu-ye-zhong 'rencai huihui' de zuoyong: zhan zai riben de jiaodu kan qi quanxin de yiyi [The effects of ‘returning talent’ in Dalian’s software and IT services industry: A novel significance seen from Japan’s perspective]” *Dalian software and IT services development report 2014*, Dongbei University of Finance and Economics Press.
- Kobayashi, Mizuki (2016) Multinational enterprise-driven industrial agglomerations business practices in China’s Dalian software industry, *Annals of Business Administrative Science*, 15.2, pp. 105-117.
- Kochi, Tsukasa (2008) “Ofushoa kaihatsu ni shippai suru hōhō [How to fail in offshore development]” Soft Research Center.
- Li, Hongzhou (2010) “Dalian ni okeru sangyō shūseki ni kansuru kōsatsu: sono keisei to tenkai wo chūshin ni [A consideration of industrial clusters in Dalian: Focusing on their formation and development]” *Hiroshima University Management Research* 10, pp. 1-13.
- Murakami, Naoki and Yan Liu (2008) “Kigyō chōsa dēta ni miru dalian sofutowea jōhō sābisu sangyō no jittai [The state of the Dalian software and information service industry as seen in company survey data]” “Chūgoku keiei kanri kenkyū [Chinese Business Management Research]” no. 7, pp. 55-75.
- Nishizaki, Kenji (2014) “Chūgoku ofushoa kigyō kōsatsu: kosuto joken no henka ga oyobosu eikyō ni tsuite [Observing offshore companies in China: The effects of changes in cost criteria]” Tanzawa, Yasuharu (ed.) *Nicchū ofushoa bijinesu no tenkai [Progress in Japan-China offshore business]*, Dobunkan.
- Parthasarathy, Balaji and Bharath M. Palavalli (2011), The Role of Standards in Technology-Driven Commodity Chains: The Information and Communication Technology Services Industry in Dalian, China, and Bangalore, India, in Moriki Ohara, M. Vijayabaskar and Hong Ling eds., *Industrial Dynamics in China and India*, IDE-JETRO & Palgrave Macmillan.

- Satō, Hiroko (2008) “*IT sābisu sangyō dai-ni-ban [IT service industry (2nd ed.)]*” Nikkei Publishing Inc.
- Tajima, Toshio (2008) “Sofutowea sangyō no tenkai to ofushoa kaihatsu, sangyō shūseki [Offshore development and industry clusters and expansion of the software industry] in Tashima, Toshio & Furuya, Shinsuke (eds.) “*Chūgoku no sofutowea sangyō to autosōshingu kaihatsu, jinzai-haken, shokugyō-kyōiku [The software industry in China and outsourcing development, personnel dispatches, and professional training]*” *University of Tokyo Institute of Social Sciences Contemporary China Research Base*, pp. 1-37.
- Takahashi, Mita (2009) “Chūgoku sofutowea sangyō no gijutsu hatten [The technical development of the software industry in China]” *Asia Research*, 55.1, pp. 40-53.
- Takahashi, Nobuhiro (2013) “Chūgoku sofutowea kigyō no gijutsu-ryoku kōjō to ofushoa kaihatsu no henka [Changes in offshore development and improvements in technical strength in Chinese software companies]” *Business Research, Osaka City University Graduate School of Business*, 64.3, pp. 1-23.
- Tencent Holdings Ltd., (<http://finance.qq.com/a/20130321/000067.htm>).
- Umezawa, Takashi (2007) “Sofutowea sangyō ni okeru kokusai-bungyō: Nihon to chūgoku no jirei [International division of labor in the software industry: The case study of Japan and China]” *Japan Academy of International Business Studies Annual Report 2007*, pp. 1-19.
- XIKANG Net, (<http://www.xikang.com/>).
- Yano Research homepage,
(<https://www.yano.co.jp/press/pdf/1504.pdf#search='%E3%82%AA%E3%83%95%E3%82%B7%E3%83%A7%E3%82%A2%E9%96%8B%E7%99%BA%E8%A6%8F%E6%A8%A1>).
- Zhang, Yan and Nozomu Kawabata (2012) “Dalian-shi ni okeru sofutowea, jōhō sābisu sangyō no keisei [The formation of the software and information services industry in Dalian, China]” *Asian Management Research* 18, pp. 35-46. English version is available
(https://tohoku.repo.nii.ac.jp/?action=repository_uri&item_id=4535&file_id=18&file_no=1).
- Zhang, Yan and Nozomu Kawabata (2013) “Dalian-shi ni okeru sofutowea kigyō no jigyō-sōzō to henkaku: 4-sha no jirei bunseki kara [Business creation and reform in Dalian-based software companies: Analysis of four companies]” *Society for Industrial Studies Japan Research Journal* 28, pp. 73-85. English version is available (https://tohoku.repo.nii.ac.jp/?action=repository_uri&item_id=4562&file_id=18&file_no=1).
- Zhang, Yingchun (2016) “Chūgoku ni okeru nihon-muke sofutowea kaihatsu kigyō no hen'yō, kadai, oyobi kongo no hōkōsei [Changes, issues, and future directions of Japan-oriented software development companies in China]” *Asian Management Research* 22 pp. 117-128.
- Zhao, Weilin and Chihiro Watanabe (2008), A comparison of institutional systems affecting software advancement in China and India: The role of outsourcing from Japan and the United States, *Technology in Society*, 30, pp. 429-436.

*This paper is a translation of the following paper published in Japanese language.

Zhang, Yan (2017), “Dairenshi ni okeru Sofutowea Joho Sabisu Sangyo no Hattenn to Tenki”, *The Journal of Asian Management Studies*, No.23, Japan Scholarly Association for Asia Management.

*This work was supported by The Telecommunication Advancement Foundation.